

CHAPTER IV

DATA ANALYSIS AND DISCUSSION

4.1 Survey Questionnaire

4.1.1 Introduction

This chapter presents the result obtained from survey questionnaires. The collected data is analysed through the statistical technique. Finally, analysis and discussion on the results will be made.

A total of 30 sets of survey questionnaire were sent out to various company in the construction industry, it is mainly comprises of the architect firm, consultant firm, contractor firm and developer firm in Malaysia. The questionnaire was aimed obtain their view of opinion about the issue of sustainable construction and Green Building materials.

A full amount of questionnaires responded were returned, it represent a response rate of 100 %.

4.1.2 Result of Research Analysis

This subtopic is based on the description in Chapter 3 (Research Methodology). It is explained the method to analyses the questionnaires by using quantitative measurement with percentage and Likert Scale in the research result analysis.

Microsoft Office Excel 2007 used in accommodates the analysis works. The data analysis is presented in charts.

The analysis discussion is based on the 2 section of questionnaires as followings:

1. Section A: Respondents Background

2. Section B: Issue related sustainable construction and green building materials

4.1.2.1 Section A: Respondent's Background

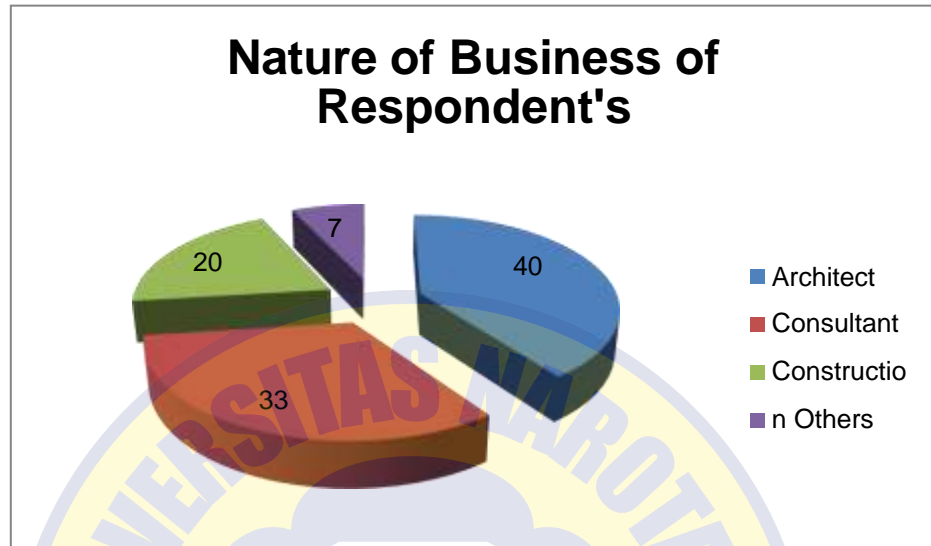


Figure 4.1: Nature of Business of Respondents Company

The data analysis examines the respondents company nature of business. This is to ensure that the involvement of respondents in construction industry and to ensure their qualification to answer the survey questionnaire which relate in construction industry. Figure 4.1 shows four different nature of business which included in the survey questionnaires. The result shows that the majority of the business nature of respondents company is Architect firms, which consists of percentage of 40 %. The second higher percentage is Consultant firms which are 33 %. Then, it followed by Construction firms which add up to 20 % and the others firm which are developer firms which only obtained 7 %.

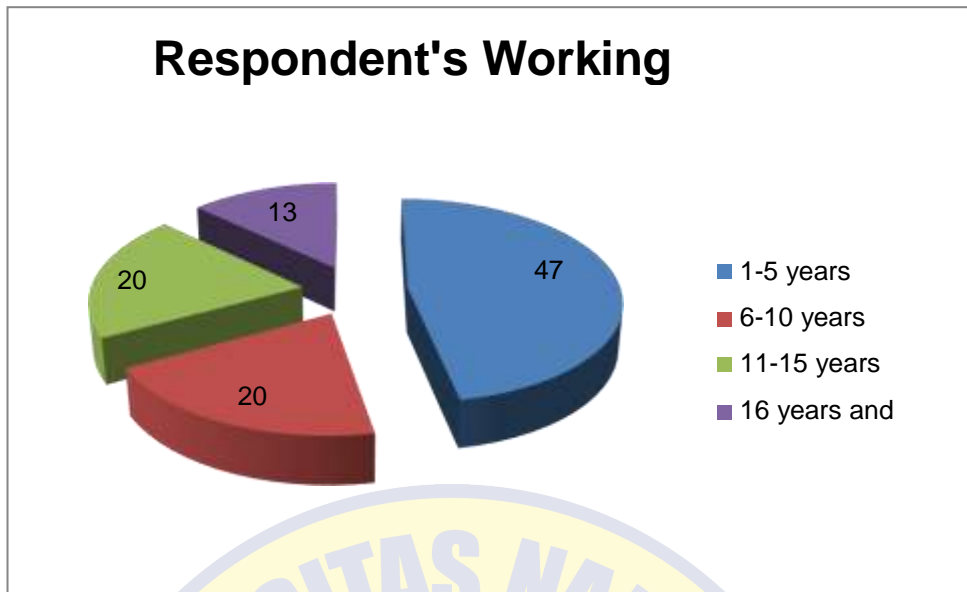


Figure 4.2: Respondent's Working Experience

Figure 4.2 shows the respondent's working experience. The pie chart is indicating the greatest number of the respondents working experience is at the range of 1-5 years which consists of 47 %. Whereas the lowest percentage of the respondent's working experience is at the range of 16 years and above. Next, the respondent's working experience at the range of 6-10 years and 11 to 15 years obtain the same percentage which is 20 %.

4.1.2.2 Section B: Issue related sustainable construction and green building materials

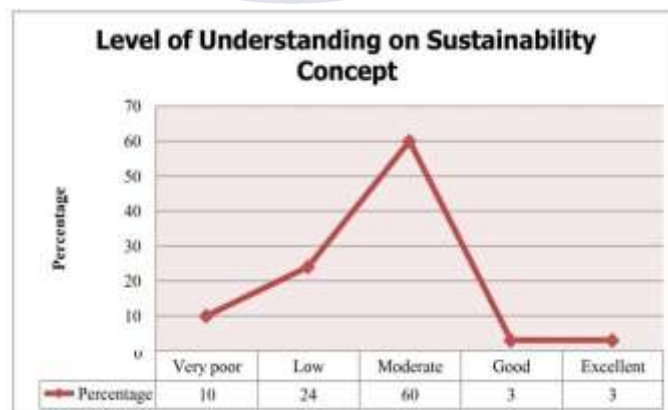


Figure 4.3: Level of Understanding on Sustainability Concept

Figure 4.3 shows the level of understanding on sustainability concept. Most of the respondents considered themselves to have moderate knowledge on sustainable concept which consists of 60 %. Then, it followed by low and very poor knowledge on sustainable concept which obtains 24 % and 10 % respectively. It is similar that merely 2 respondents, which are approximately 3 % of total respondents considered that they possessed good sustainable concept and excellent sustainable concept respectively.

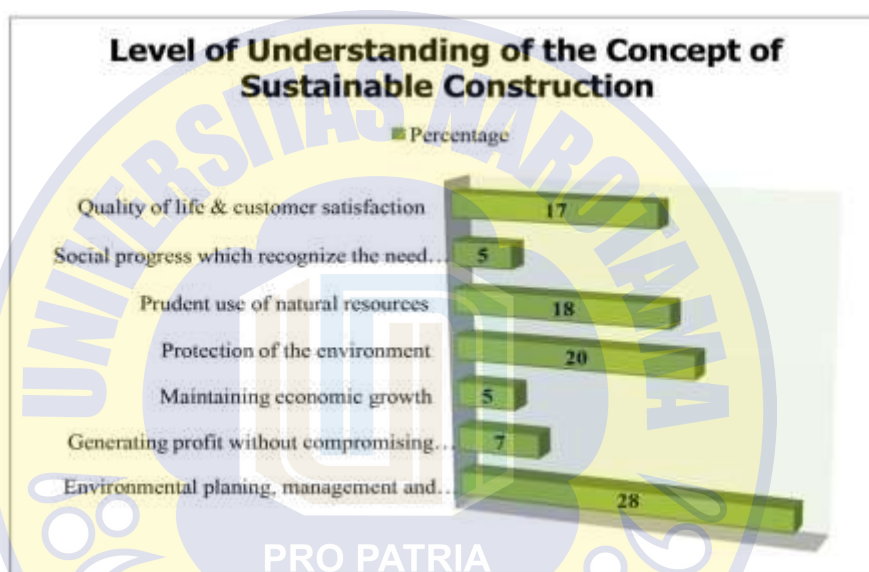


Figure 4.4: Level of Understanding of the Concept of Sustainable Construction

In order to investigate further what the respondents understand about the concept of sustainable construction, they were asked to select issues that match their understanding about the concept of sustainable construction. Issues that are related to environmental aspect of sustainability received highest percentage: environmental planning, management and control (28 %), protection of the environment (20 %) and prudent use of natural resources (18 %). Issues that related to social aspect of sustainability received moderate percentage- enhance the quality of life & customer satisfaction (17 %) and social progress which

recognize the need of everyone (5 %). Lastly, the issues the related to economic aspect of sustainability received lowest percentage: generating profit without compromising future needs (7 %) and maintaining economic growth (5 %).

From this result, it shows that the majority of the respondents understand that sustainability is about protecting the environment but many are still unaware the sustainability is also about balancing social and economy aspects of construction.

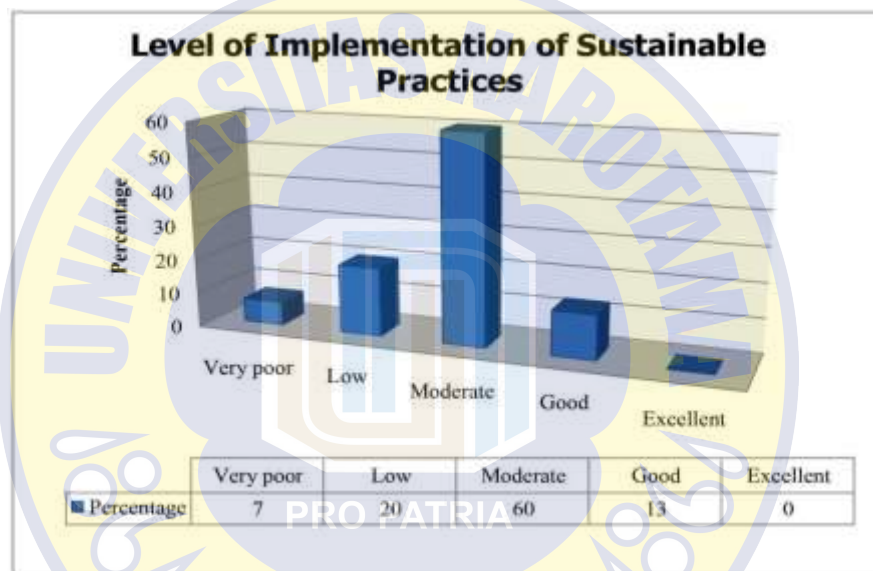


Figure 4.5: Level of Implementation of Sustainable Practices

The data analysis examines the respondents level of implementation of sustainable practices. Figure 4.5 shows that the majority of respondents considered themselves the moderate level of implementation of sustainable practices and it consists of 60 %. Then, it followed by the low, good and very poor level of implementation of sustainable practices which consists of 20 %, 13 % and 7 % respectively. None of the respondents believed that the level of implementation of sustainable practices is excellent.

Table 4.1: Factors Hindered People from Regularly Incorporating Sustainable Strategies into Their Work

Factors Hindered People from Regularly Incorporating Sustainable Strategies into Their Work	Degree of importance quoted by respondents according to five Likert scales					Importance Index	Rank
	1	2	3	4	5		
Not sure where to get information on sustainable building methods	5	8	5	6	6	0.6000	5
Lack of technical understanding on the part of others on the project team	0	7	13	6	4	0.6467	4
Lack of training or education in sustainable design or construction	0	0	11	8	11	0.8000	2
Lack of "green" materials suppliers	4	14	9	0	3	0.4933	6
Lack of interest from others on the project team	0	2	17	9	2	0.6733	3
Lack of expressed interest from clients (owners or developers)	1	1	4	8	16	0.8467	1

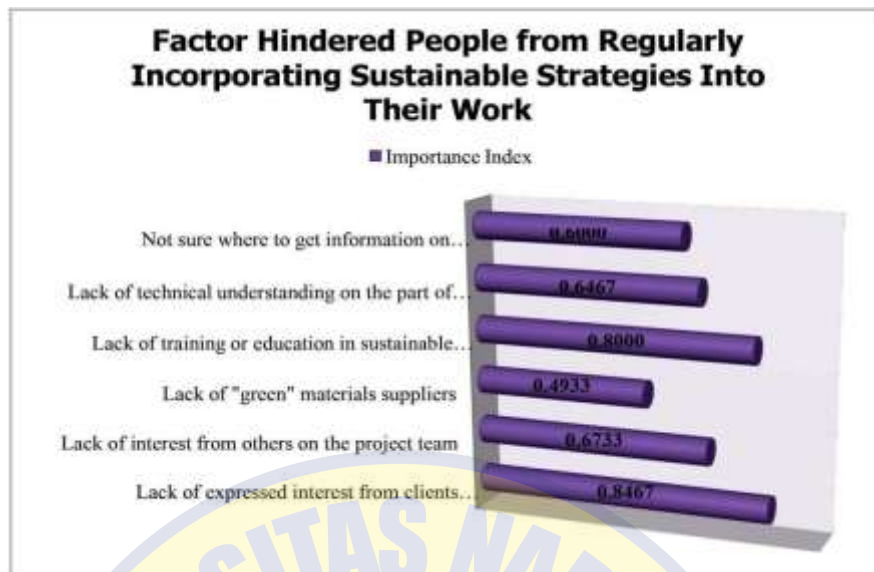


Figure 4.6: Factors Hindered People from Regularly Incorporating Sustainable Strategies into Their Work

Figure 4.6 shows the factors hindered people from regularly incorporating sustainable strategies into their work. The data collected from survey questionnaires which shows the majority respondents agreed that the main factor hindered people imposed the sustainable strategies into their work is lack of expressed interest from clients (owner or developers) which was first-ranked with the importance index of 0.8467.

Client is the main stakeholder or top management or pay master in a project and has the rights to make suggestions as to the design and construction of the project. Some of the respondents stated that sustainable construction is believed by many to be economically non-viable. Sustainable practices are believed to increase project cost because need to have higher capital upfront. Higher cost means higher price. If they pursue sustainability in the projects, they need to know

that there is a market for it because technically, the cost will be transferred to the buyers.

The second-ranked with the importance index of 0.8000 is lack of training or education in sustainable design or construction. Then, it followed by third ranking which is lack of interest from others on the project team with the importance index of 0.6733 and lack of technical understanding on the part of others on the project team which is forth-ranked with the importance index of 0.6467. The fifth ranking is not sure where to get information on sustainable building methods with the importance index of 0.6000.

The last factor with the important index of 0.4933 is lack of "green" materials suppliers. This shows positive sign. The establishment of Malaysia Green Building Confederations (MGBC) is to promote green practice and become sustainability reference organization within the growing construction market sector. GreenPagesMalaysia is the first major project of MGBC. This project solves the problems of getting the latest issue on green building materials. It is a directory listing of Green Building materials and services that are currently available in Malaysia and is designed to serve the public by providing a source of information for Green Building materials.

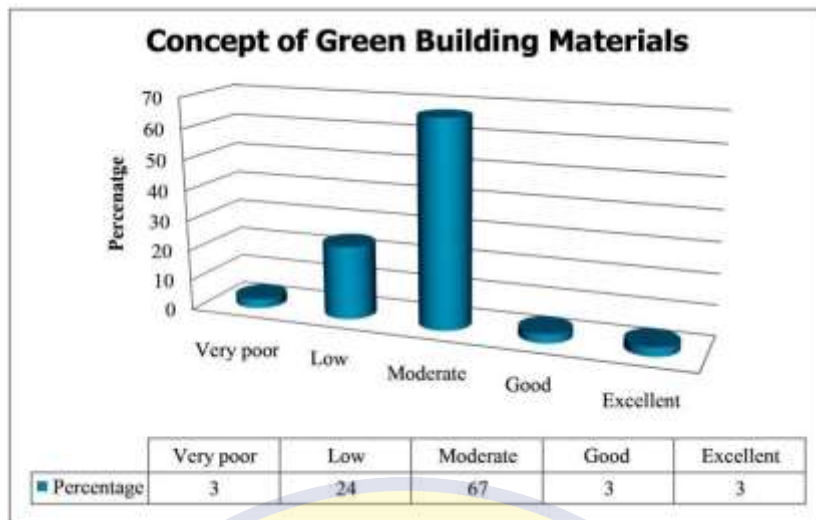
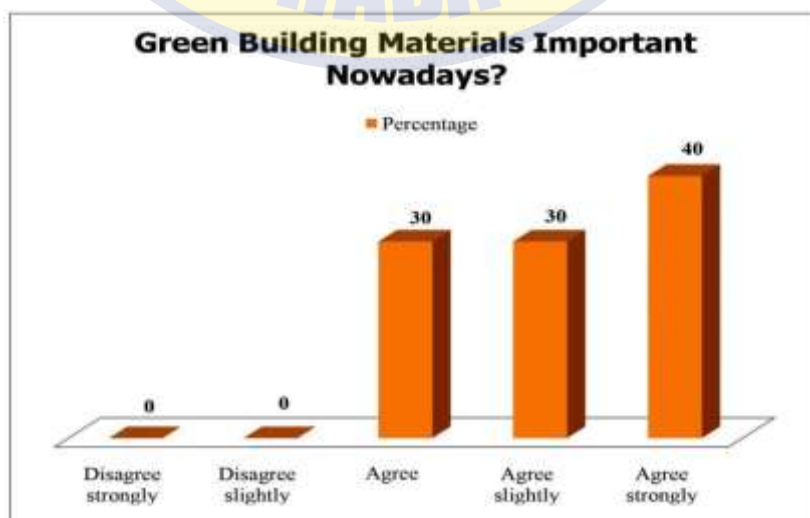


Figure 4.7 shows how familiar are the respondents with the concept of green building materials. Throughout the survey questionnaires, the result shows that majority respondents which are 20 respondents and represent by 67 % considered themselves the moderate level on the concept of Green Building materials. Then, it followed by low level on the concept of Green Building materials which attain 24 %. Next, it shows good sign that about 3 % of total respondents considered that they have good and excellent level on concept of Green Building materials respectively. However, equally on the opposite site, 3 % considered that they are still in very poor level on the concept of Green Building materials.



The data analysis examines the important of Green Building materials nowadays. From Figure 4.8 shows that majority of respondents agreed strongly that Green Building materials are important nowadays and it attain 40 %. Although some of the respondents might have the perception pertaining to Green Building materials are

expensive. In fact, they know that Green Building materials have good impact to the environment. They might have the good knowledge on sustainable concept, but they did not put it in practice or incorporating it in the projects. Knowing but not practicing is another major problem in sustainable concept implementation.

The second highest figure which is 30 % of the respondents agreed that Green Building materials are important nowadays. Meanwhile, the same figure goes to those that slightly agreed with the particular matter as well. None of the respondents disagreed that the Green Building materials are important nowadays.

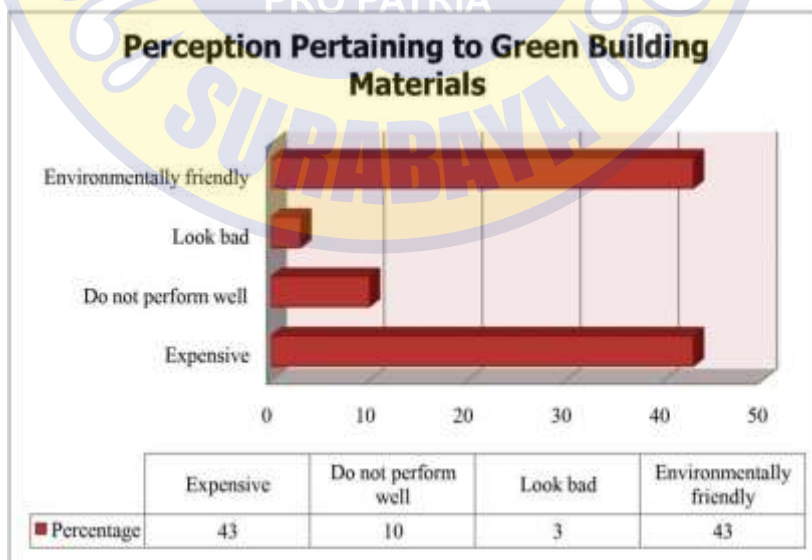


Figure 4.9: Perception Pertaining to Green Building Materials

Figure 4.9 shows the respondents perception pertaining to Green Building materials. Throughout the survey questionnaires, it is clearly shows that 43 % of the respondents perception pertaining to Green Building Materials is expensive. The majority of building owners, designers, engineers, contractors, manufacturers and building officials are receptive to protecting the environment but are not receptive to using green materials to accomplish the task. The unfortunate perception is that Green Building materials is expensive. However, it equally on the opposite site which 43 % of the respondents agree that Green Building materials is environmentally friendly. Learning deeply about the green building materials can broaden human views and knowledge and can eliminate the accustomed misperceptions about the Green Building materials. They will learn and aware that Green Building materials is sustainable to environment.

Then, it followed by the perception that Green Building materials do not perform well. Next, about 3 % of the respondents perception pertaining to Green Building materials is look bad. Decisions about aesthetic acceptability ultimately depend on personal perceptions. Sometimes, the project team worked on the projects where the client felt that the proposed green options appeared much more elegant than conventional construction materials. Conversely, they also have worked on projects where the very same green options were aesthetically unacceptable to the client.

Hence, understanding this perspective is essential for effectively resolving such concerns. It is necessary to get rid of the pervasive misperceptions about Green Building materials.



Figure 4.10: Why Green Alternative Better Than Conventional Materials and Methods

Figure 4.10 shows the reason why green alternative better than conventional materials and method. Throughout the survey questionnaires, majority of the respondents which add up to 28 % choose Green Building materials because of environmentally conscious. First message come across their mind about Green Building materials is low impact to environment. This is the fact and there are variety of advantages of Green Building materials than conventional materials and methods.

Second-ranked followed by the issue which the product can be recycled or reused at the end of its useful life in the building. This is important which can reduce the amount of waste ship off to landfills and removing the need to continually exploit new resources. It can reduce the impact on the environment.

Besides that, 19 % of the respondents agreed that Green Building materials have better performance such as energy-efficient and water-efficient. A Green Building material can earn high marks for resources management, impact on indoor environmental quality (IEQ) and performance. A Green Building material such as Autoclaved Aerated Concrete (AAC) blocks which can contribute points to Non-residential New Construction (NRNC) EE1, EE5 and MR2 under Green Building Index (GBI) assessment criteria.

Next, it followed by 14 % and 12 % of the respondents who agreed that Green Building materials is durability and easier installation. Minority of the respondents which attain 7 % believed that Green Building materials is cost less or same as conventional products. In the other words, it means that majority of the respondents agreed that Green Building materials is expensive. Some of the Green Building materials might be slightly expensive at the early stage, but it will save a huge amount of money the rest of the building lifetime. For example, green lighting system, occupant can save electrical energy as this system is using a hi-efficiency light bulb.

Table 4.2: Ranking of Green Building Materials

Ranking of Green Building Materials	Degree of importance quoted by respondents according to five Likert scales					Importance Index	Rank
	1	2	3	4	5		
Internal Wall Partition	1	3	14	4	8	0.7000	4
Ceiling	4	6	12	7	1	0.5767	6
Drywall	7	10	10	2	1	0.4667	8
Fibreglass	0	3	7	11	9	0.7733	2
High Volume Fly Ash Concrete	0	1	11	12	6	0.7533	3
Plastic, e.g. PVC	1	8	13	5	3	0.6167	5
Metal Roofing	0	2	2	14	12	0.8400	1
Wool Bricks	6	12	6	3	3	0.5000	7
Others	0	0	0	0	2	0.0667	9

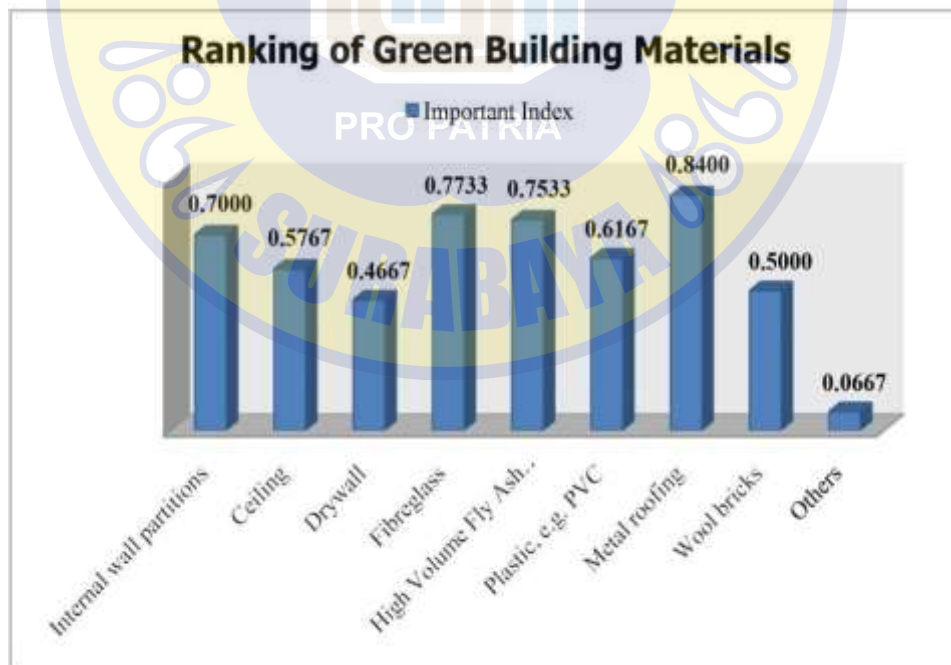


Figure 4.11: Ranking of Green Building Materials

The data analysis examines the ranking of green building materials. Figure 4.11 shows the majority respondents agreed that metal roofing is important green building materials amongst the others which was first-ranked with the importance index of 0.8400. Roofing is a major component of any structure and it is a component for which the product chosen can have a dramatic on the building's life and energy costs.

Metal roofing has first-ranked due to many benefits such as sustainability, have recycle content, low weight and others. The misperceptions that metal roofing is one that outdated and no longer in style can be eliminated. Nowadays, metal roofing has a wide variety colours and styles to meet any homeowner taste setting the home apart from the rest of the block. This issue enhances the homeowner to choose on metal roofing.

Then, it followed by fibreglass which second-ranked with the importance index of 0.7733. There are many uses for fibreglass such as thermal insulation, sound Ranking of Green Building Materials Important Index 0.7000 and 0.7733 0.8400 and 0.7533 and 0.5767 0.6167 and 0.4667 0.5000 and 0.0667 insulation, reinforcement of various materials, sound absorption and others. This enhances the usability of the fibreglass.

Third ranking and forth ranking attained by high volume fly ash concrete and internal wall partition with the importance index of 0.7533 and 0.7000. Green Building materials such as plastic, ceiling and wool bricks which were fifth, sixth and seventh-ranked with the importance index of 0.6167, 0.5767 and 0.5000 respectively. Drywall obtains the second last important index which was 0.4667 with the ranking at eight.

There are two respondents who give their suggestions and views on the other green building materials which is ranked last with the important index of 0.0667. One of the respondents who is an engineer suggests that low E-façade glass can be considered as green building materials and important for a building. Ar. Von who is the MGBC president and GBI accreditation panel member suggest that glass, water fittings, air-conditioning equipment, air filters, light fittings and landscaping are important for a building.

Table 4.3: The Importance Criteria under Resources Assessment

The Importance Criteria under Resources Assessment	Degree of importance quoted by respondents according to five Likert scales					Importance Index	Rank
	1	2	3	4	5		
Low-impact systems and materials	0	2	17	5	6	0.7000	4
Minimal use of non-renewable	0	2	7	15	6	0.7667	3
Reuse of existing buildings	2	6	11	5	6	0.6467	5
Durability, adaptability and disassembly	0	2	1	9	18	0.8896	1
Recycling and composting facilities	0	0	6	7	17	0.8733	2

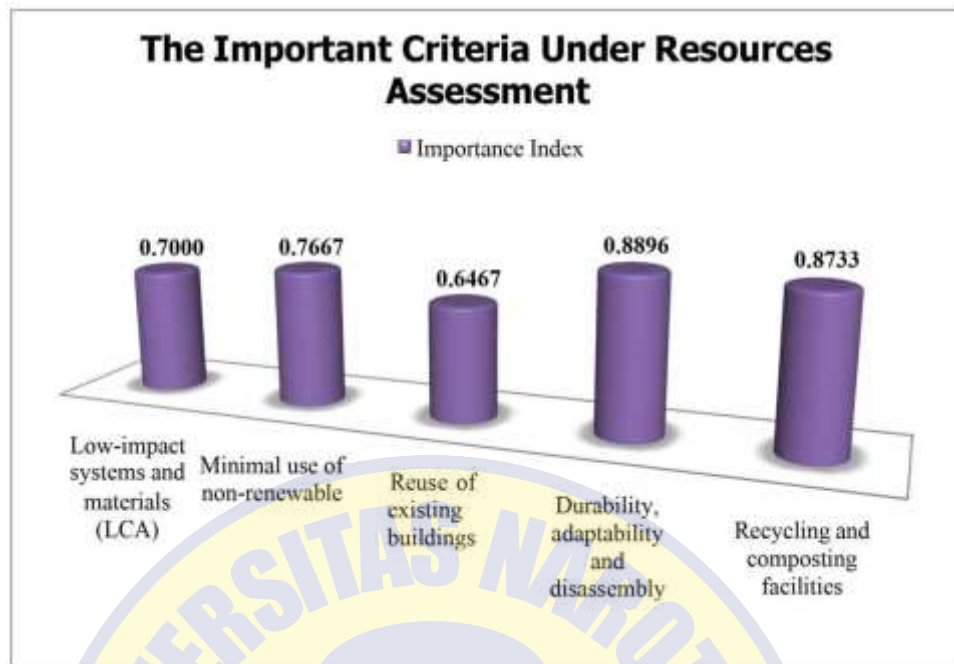


Figure 4.12: The Important Criteria under Resources Assessment

The data analysis examines the degree of importance criteria under resources assessment. Figure 4.12 shows the majority of the respondents agreed that criteria which is durability, adaptability and disassembly is important amongst the others criteria and first-ranked with the importance index of 0.8867.

The premature deterioration of buildings and buildings components has become an increasing problem in new and existing buildings. The cost for repetitive maintenance, repairs, premature replacement, potential health effects and occupant disruption of use has escalated to multibillion-dollar levels. The repairs have resulted in increased embodied energy, which over the expected lifetime of the building can far outweigh that of the originally constructed building. This has obvious impacts on the sustainability of the building industry.

Hence, this might be one of the reasons the issue of durability, adaptability and disassembly first-ranked.

Then, it followed by second-ranked which is recycling and composting facilities with the importance index of 0.8733. In today's world the importance of recycling is becoming greater of a concern both for the general public and also to the economy. Recycling along with reducing consumption is the best means to counter the damage human have been doing to the earth for centuries. Recycling is incredibly important as a means to reduce poisonous emissions into the atmosphere and also to spare the natural resources.

Next, with the importance index of 0.7667 and third-ranked is obtained by the criteria of minimal use of non-renewable. The criteria which is low-impact systems and materials (LCA) was fourth-ranked with the important index of 0.7000. The criteria which are reuse of existing buildings which was last-ranked with the important index of 0.6467. The reason might be this criteria not as important as compared to the others criteria under resources assessment. However, the awareness of reuse of existing buildings is now increasing.

Paralleling the phenomenon of recycling used products into newly formed products, the building industry has witnessed the increase of whole buildings being recycled. In the residential market, it can be see that existing homes being added onto attic space being converted to living space and remodeling work being undertaken where previous homeowners might have chosen to move rather than be burdened with the daunting tasks involved in remodeling. It is clear that urban sprawl is offset and reduced by the renovation and reuse of existing structures.

With lower interest rates, homeowners have steadily increased the volume of residential remodeling in today's market.

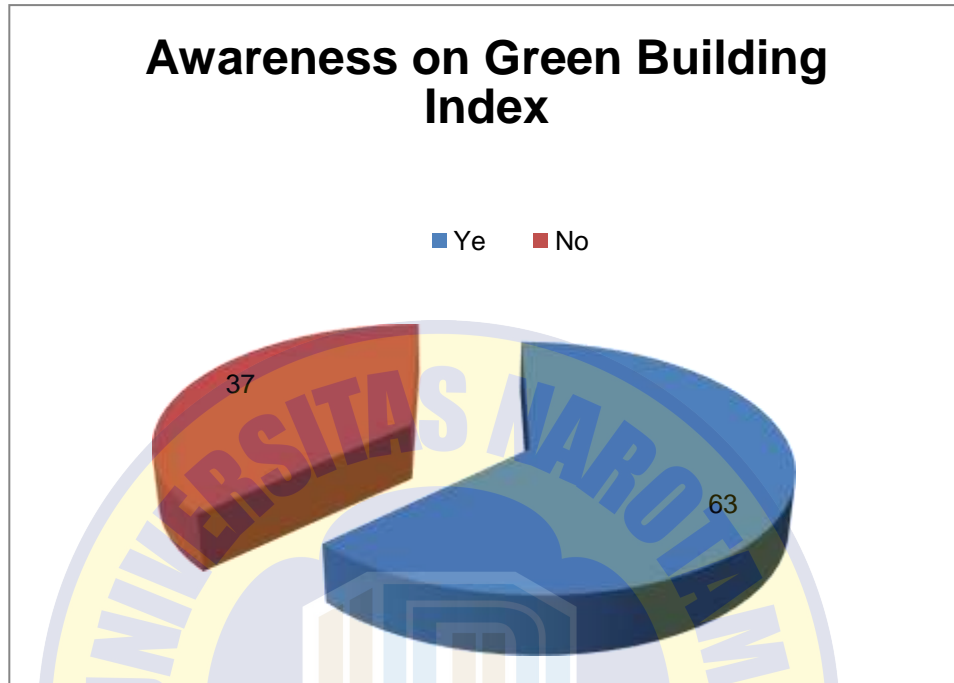


Figure 4.13: Awareness on Green Building Index (GBI)

Figure 4.13 shows the respondents awareness on Green Building Index. Green Building Index (GBI) is Malaysia's industry recognized green rating tool for buildings to promote sustainability in the built environment and raise awareness among Developers, Architects, Engineers, Planners, Designers, Contractors and the Public about environmental issues and our responsibility to the future generations. The GBI rating tool provides an opportunity for developers and building owners to design and construct green, sustainable buildings that can provide energy savings, water savings, a healthier indoor environment, better connectivity to public transport and the adoption of recycling and greenery for their projects and reduce our impact on the environment.

Throughout the survey questionnaires, it is clearly shows that 63% of the respondents have the awareness on Green Building Index (GBI). 37% which means 11 out of 30 respondents do not have any awareness on Green Building Index (GBI).

Table 4.4 : The Important Criteria under Green Building Index (GBI)

The Importance Criteria Under Green Building Index (GBI)	Degree of importance quoted by respondents according to fove Likert scales					Importance Index	Rank
	1	2	3	4	5		
Innovation (IN)	0	6	10	6	8	0.7067	6
Water Efficiency (WE)	0	1	6	14	9	0.8067	3
Materials & Resources	0	5	9	7	9	0.7333	5
Sustainable Site Planning & Management (SM)	0	0	8	10	12	0.8267	2
Indoor Environmental Quality (EQ)	0	3	8	9	10	0.7733	4
Energy Efficiency (EF)	0	0	3	6	21	0.9200	1

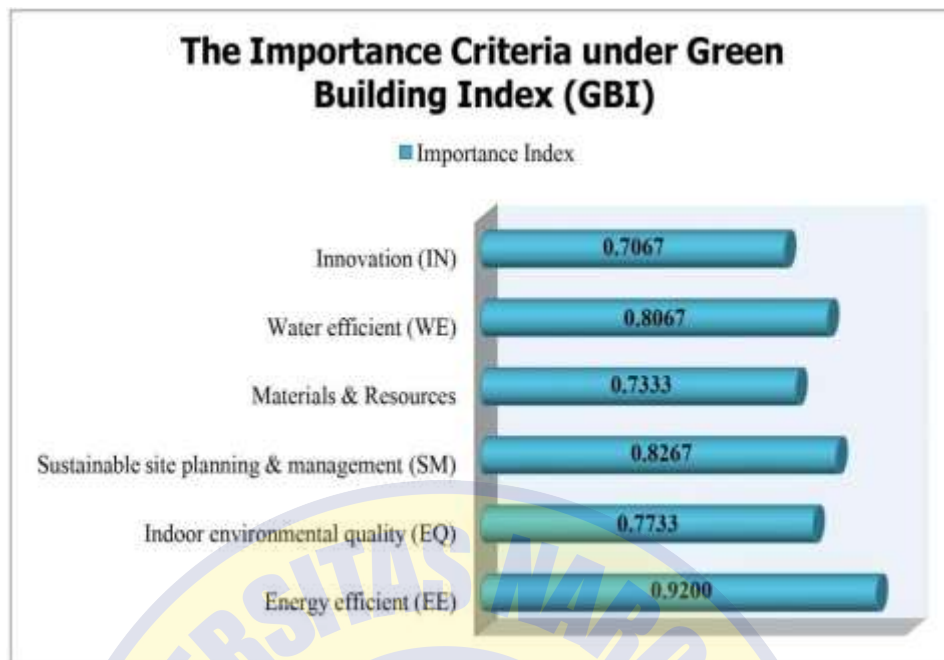


Figure 4.14 : The Importance Criteria under Green Building Index (GBI)

The data analysis examines the degree of importance criteria under Green Building Index (GBI). Through the survey questionnaires, the result that gains is that energy efficient is the most important criteria that been choose by majority respondents and first-ranked with the importance index of 0.9200. Maximum points for energy efficiency under Green Building Index assessment criteria is 23 which is the highest points amongst the others criteria. It is clearly showed that energy efficiency had played an important role in a building. Energy efficiency are important means toward the development of sustainable energy and reducing the impacts of the energy sector on the environment and reduce requirements of planting up infrastructure facilities.

Then, it followed by water efficiency which was second-ranked with the importance index of 0.8267. Water efficient is also part of the green building

concept. Optimizing water efficiency is another step in the direction of a green home. For example, water collection and reuse. There is no more cost effective water source than rain. If one rainstorm drops 1 inch of rain on the yard, it equivalent of over 250 bathtubs of water trickle by.

Next, indoor environmental quality was third-ranked with the importance index of 0.8067. Some peoples might argued that it is not only desirable, but also a fundamental human right to live and work in spaces with healthy indoor environments. Buildings enhance peoples lives when they permit ample air circulation, maintain clean air and comfortable temperatures and allow individuals to have a sense of control over their own indoor experience.

Fourth and fifth-ranked attained by materials and resources and sustainable site planning & management with the importance index of 0.7733 and 0.7333. The last-ranked was represented by innovation with the important index of 0.7067. Maximum points for innovation under Green Building Index assessment criteria is only 6 which is the lowest points amongst the others criteria. This might be the reason which the parties might not have higher attention on this criteria if compared to others criteria.

However, every item under green building index (GBI) assessment criteria is important as the points collected is to determine the rating of a building such as certified, silver, gold and platinum.

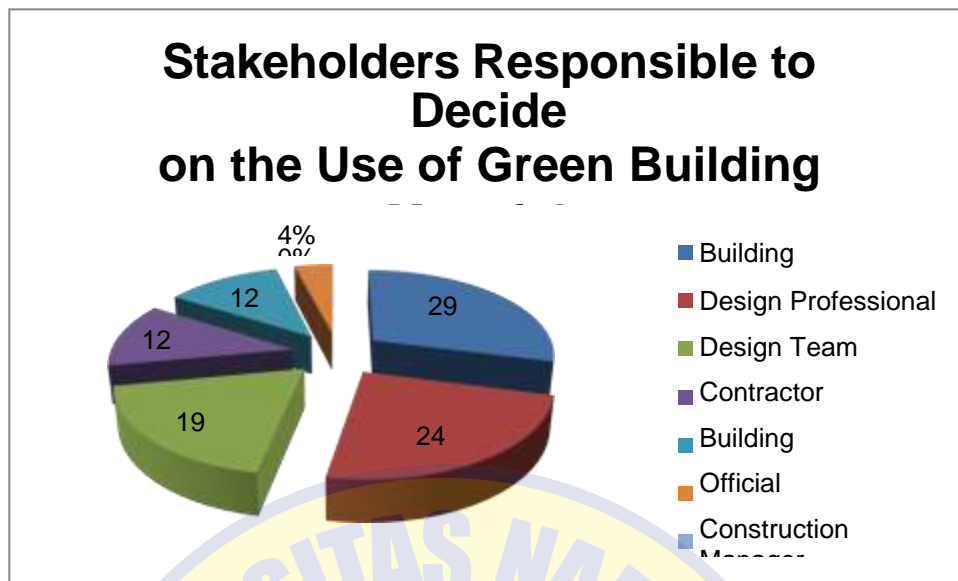


Figure 4.15: Stakeholder Responsible to Decide on the Use of Green Building Materials

Figure 4.15 analyses the stakeholders who are responsible to decide on the use of Green Building materials. Through the survey questionnaires, the majority of the respondents which was 29 % agreed that building owner is the main stakeholder to decide the use of green building materials. The building owner is the person whose idea the building was in the first place and also responsible for funding the construction of the project and for operating it once it is complete.

Next, the second-ranked is by the designs professional which achieve 24 %. Design professionals are the one who assess the available material options and evaluating the green information sources. They know where to obtain current standard of care information in order to be able to verify a manufacture's claims. Nowadays, there are many website for design professional to search for the Green

Building materials as for example green pages Malaysia. Hence, this will be no problems to apply the Green Building materials to a building.

Then, it followed by third-ranked which is design team with 19 % of respondents. A good communication and understanding can help the design team on identify, specify and utilize green building materials effectively in a project. For example, the continuous updated of the green building materials by the manufacturer to the Architect can broaden him the knowledge and information on the materials or products and can apply them in a project effectively.

Forth-ranked represented by two types of stakeholders which are contractor and building official obtain the same percentage which is 12 %. Minority respondents believed that construction manager responsible to decide the use of green building materials which obtain 4 %. All the respondents believed that subcontractor not involve actively in decide the use of green building materials where subcontractor only enter the contract with contractor to perform a specific portion of the construction contract or to supply materials for a project.

Table 4.5 : Media to Enhance the Awareness Level of Green Building Materials

Media to Enhance the Awareness Level of Green Building Materials	Degree of importance quoted by respondents according to five Likert scales					Importance Index	Rank
	1	2	3	4	5		
Government Intervention	0	0	2	8	20	0.9200	1
Experience	0	0	3	23	4	0.8067	3
Education through conferences, trainings, seminars or workshops	0	0	7	8	15	0.8533	2
Parties itself <i>(May have good knowledge on the concept but did not put it in practice in projects)</i>	0	0	6	18	6	0.8000	4

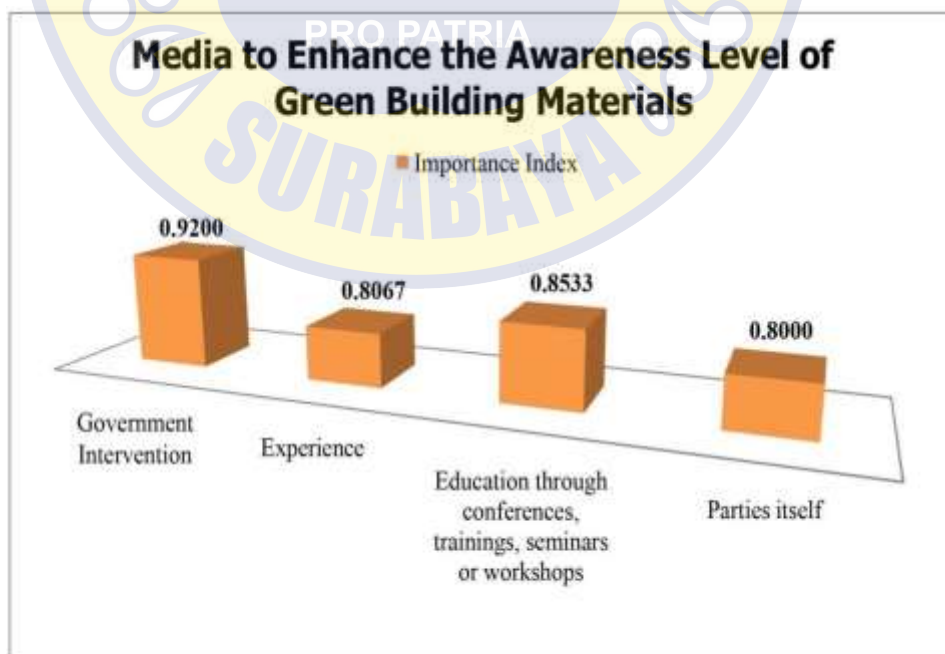


Figure 4.16: Media to Enhance the Awareness Level of Green Building Materials

Figure 4.16 requires the respondents to give their opinion which media enhance the awareness level of Green Building materials. Through the questionnaires, it shows that government intervention is the most important media amongst the others which to enhance the awareness level of green building materials with the importance index of 0.9200. Majority of the respondents believed that the government plays a bigger role in promoting sustainable construction, through actions such as through strong enforcement of legislation, devising new policy or giving incentives to the parties who want to pursue sustainability in their projects.

The second-ranked media is education through conferences, trainings, seminars or workshops with the importance index of 0.8533. Some of the respondents believed that through this media can enhance and increase the stakeholder's knowledge and awareness on the Green Building materials. Education should not limit to the construction players only but also expanded to the wider stakeholders.

Next, it followed by third-ranked media which is experience with the importance index of 0.8067. The younger generation, however, have been exposed about sustainable construction in their higher education level, however due to their lack of experience in the real world, they have problem disseminating their theoretical understanding of sustainability knowledge into practice.

The last-ranked with the importance index of 0.8000 is due to the parties itself. Parties may have good knowledge on the concept but did not put it in practice in projects. This issue will create problems and difficulty in implementing the sustainable concept.



Figure 4.17: Prospect of Implementing Sustainable Practices in 5 Years

Finally, the respondents are request to give their opinion on the prospect of sustainable construction application in Malaysia in 5 years. Figure 4.17 shows that 33 % of the respondents believed that in 5 years, not much will change and the level is still moderate. However, equally on the opposite site, 33 % of the respondents believed that it will get better (good) on sustainable practices in Malaysia. About 23 % of the respondents believed that is will still be low. That is still good news that 7 % of the respondents believed that the prospect of implementing sustainable practices in 5 years is excellent. There are few people which are 3 % who think that the future of sustainable construction is very poor.

4.1.3 Conclusion

The above discussion of findings explains the consequences with respect to achieving sustainable material for buildings that reflects sustainable development principles in construction industry in Malaysia. This chapter has related the analysis and conclusion from the outcomes of the distributed questionnaires. This questionnaires survey has opened a broader discussions and opinions from stakeholders in the Malaysia's construction industry. The derived findings could be used to propose new and better sustainable materials for sustainable building developments.

4.1.3.1 Section A: Respondent's background

Question 1: Nature of Business of Respondent's Company

The research shows that majority of the respondents which represent by 40 % are work at Architect firms. Then it followed by Consultant firms and Construction firms which is 33 % and 20 % respectively. Minority of the respondents are work at developer firms which only obtain 7 %.

Question 2: Respondent's working experience year

The result shows majority of the respondents working experience is at the range of 1 - 5 years which represent by 47 %. Next, respondents working experience at the range of 6 - 10 years and 11 - 15 years obtains by the same figure which is 20 %. The least percentage of the respondents working experience is at the range of 16 years and above and it consists of only 13 %.

4.1.3.2 Section B: Green Building Materials issues

Question 1: Level of Understanding on Sustainability Concept

Most of the respondents which represent by 60 % believed themselves to have moderate level of understanding on sustainability concept. Then, it followed by 24 % and 10 % of the respondents who considered themselves to have low and very poor level of understanding on sustainability concept. It is similar that merely 2 respondents, which are approximately 3 % of total respondents considered that they possessed good sustainable concept and excellent sustainable concept respectively.

Question 2: Understanding of the Concept of Sustainable Construction

Majority of the respondents believed that sustainable construction is about the environmental issue. The three highest ranking is environmental planning, management and control which consist of 28 %. Then, it followed by protection of the environment and prudent use of natural resources which represent by 20 % and 18 % respectively. Next, some of the respondents believed that sustainable construction related to the social issue. 17 % and 5 % of the respondents agree that sustainable construction is about the quality of life & customer satisfaction and social progress which recognize the need of everyone. Minority of the respondents relate their understanding of sustainable construction to economic issue. 7 % and 5 % of the respondents considered the sustainable construction is about generating profit without compromising future needs and maintaining economic growth.

Question 3: Level of Implementation of Sustainable Practices

18 out of 30 respondents considered they have the moderate level of implementation of sustainable practices which represent by 60 %. Then, it followed by the low, good and very poor level of implementation of sustainable practices which adds up to 20 %, 13 % and 7 % respectively. None of the respondents believed that the level of implementation of sustainable practices is excellent.

Question 4: Factor Hindered People from Regularly Incorporating Sustainable Strategies into Their Work

First-ranked factor is lack of expressed interest from clients (owners or developers) with the importance index of 0.8467. Then, it followed by lack of training or education in sustainable design or construction with the importance index of 0.8000 and lack of interest from others on the project team with the importance index of 0.6733. The forth-ranked and fifth-ranked factor is related with the lack of technical understanding on the part of others on the project team and not sure where to get information on sustainable building methods with the importance index of 0.6467 and 0.6000 respectively. The last-ranked factor is lack of "green" materials suppliers with the importance index of 0.4933.

Question 5: Concept of Green Building Materials

Majority respondents which represent by 67 % considered themselves to have the moderate level on the concept of Green Building materials. Then, it followed by low level on the concept of Green Building materials which attain 24 %. Next, it shows good sign that about 3 % of total respondents considered that they have good and excellent level on concept of Green Building materials

respectively. However, equally on the opposite site, 3 % considered that they are still in very poor level on the concept of Green Building materials.

Question 6: The Important of Green Building Materials Nowadays

40 % of the respondents strongly agreed that Green Building materials are important nowadays. The second highest figure which is 30 % of the respondents agreed that Green Building materials are important nowadays. Meanwhile, the same figure goes to those that slightly agreed with the particular matter as well. None of the respondents disagreed that Green Building materials are important nowadays.

Question 10: The Important Criteria under Resources Assessment

Top ranking is durability, adaptability and disassembly with the importance index of 0.8896. Second ranking with the importance index of 0.8733 is recycling and composting facilities. The third ranking and forth ranking is minimal use of non-renewable and low-impacts systems and materials with the important index of 0.7667 and 0.7000. The last ranking with the important index of 0.6467 is reuse of existing buildings.

Question 11: Respondent's awareness on Green Building Index (GBI)

63 % of the respondents know about Green Building Index (GBI). However, 37 % of the respondents have less awareness on Green Building Index (GBI).

Question 12: The Important Criteria under Green Building Criteria (GBI)

Majority of the respondents vote the energy efficiency as the most important criteria under Green Building Index (GBI). It obtains importance index of 0.9200. The second ranking and third ranking is sustainable site planning & management with the important index of 0.8267 and water efficiency with the importance index

of 0.8067. Then, it followed by the criteria which is indoor environmental quality and materials & resources with the importance index of 0.7733 and 0.7333. The last ranking is innovation with the importance index of 0.7076.

Question 13: Stakeholders who responsible to Decide on the Use of Green Building Materials

29 % of the respondents agreed that building owner is the most important stakeholder in deciding on the use of Green Building materials. Then, it followed by design professional and design team which 24 % and 19 % of the respondents vote on it. There are 12 % of the respondents who agreed that contractor and building official are one of the important stakeholders to decide on the use of Green Building materials. Only 4 % of the respondents believed that construction manager play an important role in deciding on the use of Green Building materials. However, none of the respondents agreed that the subcontractor is important to make decision on the use of Green Building materials.

Question 14: Media to Enhance the Awareness Level of Green Building Materials

The top ranking with the importance index of 0.9200 is government intervention. Second ranking is education through conferences, trainings, seminars or workshops with the importance index of 0.8533. Experience is third ranking with the importance index of 0.8067. The last ranking with the importance index of 0.8000 is parties itself, they may have good knowledge on the concept but did not put it in practice in projects.

Question 15: Prospect of Implementing Sustainable Practices in 5 Years

There are 33 % of the respondents believed that in 5 years, not much will change and the level is still moderate. Meanwhile, there also 33 % of the respondents believe that it will get better on sustainable practices in Malaysia. About 23 % of the respondents believed that it will still be low. However, 7 % of the respondents believed that the prospect of implementing sustainable practices in 5 years is excellent. There are few people which are 3 % who think that the future of sustainable construction is very poor.

4.2 Interview

4.2.1 Introduction

There are total of two interviewees had been conducted which are from different background. They have better knowledge on sustainable construction and involve in construct Green Building. The interview questions were prepared to obtain the information on sustainable construction and the green building materials.

The interview process has been conducted within the district of Kuala Lumpur. There a total of two participants had been interviewed for the evaluation of results. Based on their professional knowledge and invaluable experience, the results obtained are supportive and applicable.

The backgrounds of the interviews are briefly described in short notes as listed below. The background information is data on the interviewees name, profession, company name, and current position in company.

Table 4.6 : Background of Interviewees

Interviewees Name	Profession	Company Name	Current Position
Ar. Von Kok Leong	Architect	MAA Sdn. Bhd.	Director
Ms. Ng Pek Har	Engineer	Web Structures (M) Sdn. Bhd.	Director

4.2.2 Summary of Interviews

4.2.2.1 Architect

In the view of, he supports that sustainability construction is important nowadays. The Earths ecosystems are now at a critical stage where they are not only being severely damaged but human activity currently leads to irreversible losses of critical (i.e. life-supporting) ecosystem functions. Buildings and construction works have the largest single share in global resource use and pollution emission. In order to save our environment, one of the ways is to use green building materials in construction industry.

However, Malaysia construction industry still encountered the problem of lacking people using green building materials. He had given his opinion state that some of the people still hesitate using green building materials because of the lack of knowledge and the wrong perception of very high costs. Fortunately, Malaysia Green Building Confederation (MGBC) organise to help educate the public on sustainability. As for the costs, he hope that through wider usage and competition on green building materials, it will reduce and will no longer be an issue.

Malaysia Green Building Confederation (MGBC) mission is to driving force towards a sustainable built environment in Malaysia. As a president of MGBC and a director of an Architect firm, definitely Ar. Von will consider using green

building materials in his design. He explains that architecture and the concept of sustainability go hand in hand. When architects design a new development, major issues regarding site selection, orientation, site context, passive design matters must be considered and applied in the designs. The suitability, costs, green alternatives (the raw materials used and the processes of manufacturing) and availability will be considered when determine the type of green building materials to be use in a building.

According to he it must first start with the Architect to determine the use of green building materials in a building. Architect will initiate the discussion on green building materials with client and other consultants. Next, he will have to confirm the availability of green building materials and clarify of specifications to bidder during the bidding. As there are various type of green building materials in the construction industry, Ar. Von suggest architects, consultants or other professionals can refer to Malaysia Green Building Confederation GreenPagesMalaysia (GPM) for a list of green building materials. The GreenPagesMalaysia (GPM) will be updated regularly with new listings.

When architects select green building materials, they need not to get any approval from local authorities. Local authorities do not specify any materials nor control the type of green building materials to be used. Besides that, Ar. Von also state that their design will follow some of the procedures or forms such as all the Green Building Index (GBI) rating tools which cover Malaysia codes and bylaws such as UBBL, QLAS SIC, IBS and other relevant overseas codes like ASHRAE.

He suggests using Industrialised Building System (IBS) Score form to evaluate a building. A sample of IBS Score form was included in Appendix H.

Industrialization process is an investment in equipment, facilities and technology with the objective of maximizing production output, minimizing labour resource and improving quality while a building system is defined as a set of interconnected element that joint together to enable the designated performance of a building.

Higher IBS Score is a reflection of a higher reduction of site labour, lower wastage, less site materials, cleaner environment, better quality, neater and safer construction sites, faster project completion as well as lower total construction costs.

However, to determine how sustainable a building, Ar. Von recommends using Green Building Index (GBI) rating tools. A sample of GBI Assessment Criteria was included in Appendix G. He further explain on Green Building Index (GBI) which GBI is Malaysia's industry recognised green rating tool for buildings to promote sustainability in the built environment and raise awareness among Developers, Architects, Engineers, Planners, Designers, Contractors and the Public about environmental issues and responsibility to the future generations. The GBI rating tool provides an opportunity for developers and building owners to design and construct green, sustainable buildings that can provide energy savings, water savings, a healthier indoor environment, better connectivity to public transport and the adoption of recycling and greenery for their projects and reduce impact on the environment.

How a building being assessed for the criteria in a building, e.g. residential New Construction? Ar. Von had clearly explains on this statement. Firstly, the Architect and his Consultants have to come out with a concept design. Then, a

GBI Facilitator will be engaged to work with the team to achieve a rating using the relevant GBI tool. The Facilitator submits to GBI the design for registration, and be followed by submission for Design Assessment (DA). Upon completion of the evaluation by GBI, a Provisional Certification will be given.

When the building has completed construction, GBI will come and conduct a Completion and Verification Assessment (CVA), and a Final Certification will be issued for the building.

Within the DA process, the Facilitator must prove that the design complies with the intents of the green assessment criteria for Energy Efficiency, Indoor Environment Quality, Site Selection and Management, Water Efficiency, Materials and Resources, and Innovation. Points will be given based on the criteria, and the total points will determine whether the building is rated Certified, Silver, Gold or Platinum.

Before the interview ended, Ar. Von had given his view on the issue of sustainability in Malaysia. In his view, he state that Green Building Index (GBI) and Malaysia Green Building Confederation (MGBC) started only a little more than 2 years ago. In that short time, the ideas of green buildings have gained support from architects, engineers, designers, developers, builders, and government. He hopes to see green buildings become the norm and through education, he hope to see all of the parties in construction industry practice sustainability. The main driver of sustainability is the state of the environment around us. In the end, the environment will benefit, and in turn, all of us will benefit from a good, clean environment. The environment belongs to all of us, and it does not discriminate.

Critical Review

The Author agreed with Ar. Von that Malaysia Green Building Confederation (MGBC) had play an important role in promote the sustainable concept. It is important as MGBC to be the reference centre for sustainable building resources in Malaysia. Besides that, MGBC provide facilities interchange with other associations carrying on similar work or with Government, local authorities, educational and scientist bodies. Furthermore, it also is the platform for networking nationally and internationally. MGBC provide better understanding and knowledge to the parties in construction industry which can have a tangible positive impact on the built environment whilst achieving reduced costs and possibly multiple bottom lines. Managing built environment will inevitable has constructive effects to the earth.

4.2.2.2 Engineer

Based on the interview, and comments that green building materials are important nowadays. However, there is still a lack of people using green building materials. Why? In the opinion of , she state that because of a lack of interest in or demand for sustainable building from clients (owners/developers). Besides that, a lack of training and education in sustainable design/construction also become one of the reasons. The next problem is the failure of service fee structures to account for the recovery of long-term savings. Lastly, the higher costs (both real and perceived) of sustainable building options during the preliminary stage had encountered a problem.

In order building and construction instruction move towards sustainability in the built environment, it is necessary for people to steps outside the circle and tries

something new. says that there is no doubt that she will consider of using green building materials in her design as the usage of green building materials will have a lot of advantages. Firstly, it can increase the efficient of resource use such as energy, water and materials. Besides that, to improve the quality of human life while maintain the capacity of ecosystem during the buildings lifecycle. Third, the usage of green building materials can harmonize with the local climate, traditions, culture and surrounding environment.

She had clarified the type of green building materials into four categories which are recycled materials, natural materials, renewable resources and reclaimed materials. Since there is very little for recycled materials, if any, extra material needed to make these already made building materials feasible in constructing buildings, there would be no extra depletion on the earths resources. Old tires are a perfect example of green building products which can be used to create decorative elements like baseboards, insulation, and other things like pipe systems in the buildings such as homes. Natural materials can be used are normally environmentally friendly and can create a very good foundation for a comfortable office or a home.

The use of renewable resources not only creates a green environment but ensures that the future generations will get resources to use in their environmentally friendly projects. The benefits of rescued building materials is the fact that there would be no extra manufacturing involved, neither will there be a consumption of fossil fuels in the course of the building project because the materials will not be transported from far-away places. Reclaimed bricks, timber, among other elements also reduce the cost of construction as the materials are

normally available at an affordable rate compared to newly manufactured products.

She had further explained on how she relates the sustainability in her works. Firstly, she will design the buildings which built primarily with wood and it will have a lower embodied energy than those built primarily with brick, concrete or steel. Second, build with passive solar building design which is often implemented in low energy homes. Third, effective window replacement (day lighting) can provide more natural light and lessen the need for electric lighting during the day. Forth, in order to maximum extent feasible, facilities should increase their dependence on water that is collected, used, purified and reuse on-site.

Next, design the dual plumbing that recycles water in toilet flushing. Waste water may be minimized by utilizing water conserving fixtures such as ultra-low flush toilets and low-flow shower heads. Finally, building materials typically considered to be „green" include rapidly renewable plant materials such as bamboo and straw, insulating concrete forms, recycled stone, recycled metal and other products that are non-toxic, reusable, renewable and/or recycled.

How can green building materials be used in the design and who is responsible to make decision on this? According to Ms. Ng, there is neither client nor architect to decide the use of green building materials. It shall be the team work where client and design team to discuss and achieve the final foal during the preliminary stage. The decision will be made after having discussion with the client and the project team pertaining to the aim, design concept and cost budget. During the bidding phase, architects have to ensure all bidder well known of their

responsibility and to ensure all bidder aware of the design concept and project teams expectation for the green building.

Design professional will having discussion with the manufacturer or suppliers or project team on the specification and ability of the product before having a final decision on the materials selection. After selection on the materials, project teams have to make sure all materials shall be prepared with the specifications for ease of reference. Besides that, there will be some procedures or guidelines to be follow in the design. For an example, on site detention tank shall be design according to the MSMA guideline.

All team members of project team, building owners, developers and other parties are encouraged to use the Green Building Index to validate environmental initiatives at the design phase of new construction or base building refurbishment or construction and procurement phase of buildings. Use of the Green Building Index is encouraged on all such projects to assess and improve their environmental attributes.

She had briefly explains on the GBI Index. Interested parties should complete and submit the GBI application form to Green Building Index Sdn Bhd (GSB). A GBI facilitator will then be appointed for the project and undertake the Design Assessment for GSB. The GBI Facilitator will upon completion, table the assessment report to the GBIAP to register and award the certification. The provisional GBI Design Assessment certification will then be issued with the accompanying GBI score sheet to show the scores achieved.

The final GBI award will be issued by the GBIAP upon completion of this Completion & Verification Assessment (CVA). Buildings are awarded GBI -

Platinum, Gold, Silver or Certified ratings depending on the scores achieved as shown in the following table. Buildings will have to be re-assessed every three years in order to maintain their GBI rating to ensure that the buildings are well-maintained.

Table 4.7: Green Building Index Classification

GREEN BUILDING INDEX CLASSIFICATION	
86 points and above	Platinum
76 to 85 points	Gold
66 to 75 points	Silver
50 to 65 points	Certified

As a conclusion, she gave her view on the issue of sustainability in Malaysia. She comments that there shall be institutional accommodation of sustainability discourse. Environmental conservation and pollution control constitute the underlying themes (vertical policy integration), horizontal integration of sustainable development is still minimal in Malaysia. The distinction between separate environmental issues and sustainability as an integrated policy is yet to be established. Next, there shall have the role of normative change. Malaysia lacks political commitment to sustainable development. Lastly, there should have legal change. There has been no comprehensive reform of environmental and natural resource legislation in the context of sustainable development.

Critical Review

The Author had made further literature review after this interview, the fact n figure were discovered. Based on budget 2010 and 2011, Malaysia seems to have paid more attention on sustainable development.

Malaysia has undergone over 50 years of rapid industrialization recording between 5% and 9% growth annually. Unfortunately, most of that development has been unsustainable at best and there is now a need for a holistic approach to sustainable development. Last year, tax breaks and incentives were introduced by the Government of Malaysia under the Budget 2010 to encourage the move towards green buildings under the heading of „Developing Green Technology“, and this commitment was renewed by the Government in its Budget 2011. Government has introduced and pledged to maintain and proposed several significant improvements in terms of tax incentives, among others:

- i. Pioneer Status and Investment Tax Allowance for the generation of energy from renewable resources and energy efficiency activities until 31 Dec 2015.
- ii. Import Duty and Sales Tax exemption on equipment for the generation of energy from renewable resources and energy efficiency until 31 Dec 2015.
- iii. The Feed-in Tariff (FiT) Mechanism, under the Renewable Energy (RE) Act, will be implemented to allow RE generated by individuals and independent providers to be sold to electricity utility companies
- iv. Building owners obtaining GBI Certificate from 24 October 2009 until 31 December 2014 be given income tax exemption equivalent to the additional capital expenditure in obtaining such Certificates.

- v. Buyers of buildings and residential properties awarded the GBI certificates bought from real property developers be given stamp duty exemption on instruments of transfer of ownership of such buildings.

4.2.3 Conclusion

As a conclusion, both interviewees strongly agreed that green building materials are important in Malaysia nowadays. However, the advantages of green building materials have not been firmly seized due to the slow permeation of this concept among the construction practitioners.

Ar. Von had stated Malaysia Green Building Confederation (MGBC) is to promote green building programmes, technologies, design practices and processes as well as green labels in embracing responsible sustainable measures and other green requirements for environmental, social and economic benefits. MGBC as the lead green building non-governmental organisation in Malaysia encourages the establishment of building materials or products eco label framework and GreenPagesMalaysia represents the first step in the move towards this. The market is ready for an initiative such as GreenPagesMalaysia for the listing of environmentally responsible Green Building materials or products or services.

However, Ms. Ng stated that more strategies and actions should be pursued actively to speed up the process in creating a sustainable-oriented construction industry, which is paramount towards building a sustainable future.